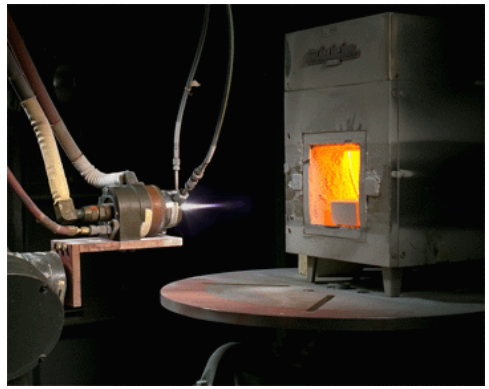
NASA Glenn Success Stories

Environmental Barrier Coatings

United Technologies Research Center, East Hartford, CT and General Electric, Schenectady, NY

TECHNOLOGY

Silicon-based hot section structural components, such as monolithic Si_3N_4 and fiber reinforced ceramic matrix SiC/SiC composites, require protection from water vapor attack when used in combustion environments of gas turbine engines. Environmental barrier coatings (EBC) have been developed and demonstrated to effectively protect and greatly extend component life.

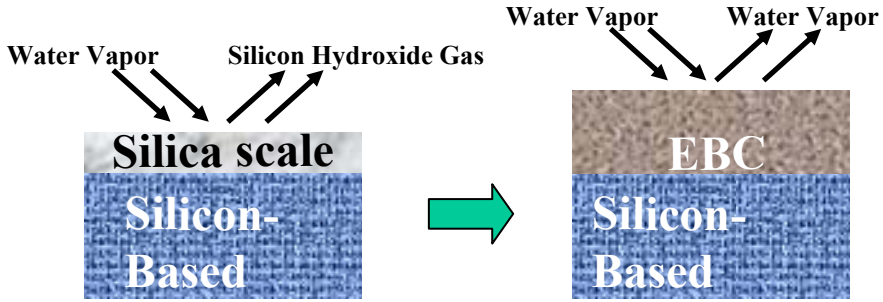


EBC Deposition

COMMERCIAL APPLICATION

◆Environmental protection of silicon-based stationary and rotating components for aeropropulsion, power generation, automotive, engines and industrial furnaces

◆Demonstrated 24,000 hr. combined operation of three (3) Solar Turbine, Inc. power generation engines without failure



SOCIAL / ECONOMIC BENEFIT

◆Reliable protection of ceramic from environmental attack will hasten the application of fiber-reinforced Si-based ceramic matrix composites (CMC) and monolithic silicon nitride into commercial engine, with improved performance and long-life durability

◆EBC-coated CMC combustor liners offer the potential to increase the material temperature by ~ 400°F, longer life, and reduced emissions as compared to today's metallic combustor.

NASA APPLICATIONS

◆Developed for application in supersonic engine CMC combustor lines (High Speed Research)

◆Aeropropulsion system hot section components, I.e. CMC combustor liners and nozzles, as well as CMC and silicon nitride vanes and blades

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